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pletely launched and set under way. (4) We must study great numbers of individuals and employ statistical methods of comparison. (5) The doctrine of discontinuous evolution is now clearly before us. (6) We are beginning to find a pathway through the bewildering maze of hybridization."—J. M. C.

River plankton.

IN a *Bulletin* of the Illinois State Laboratory of Natural History,[3] a bulky volume of something over five hundred pages, we have by far the most important contribution yet made to the subject of potamoplankton. There have been many extended series of observations on the plankton of lakes, but river plankton has received very little attention. This has been partly because of the greater richness of limnoplankton, partly because the problems of limnoplankton are simpler than those of potamoplankton, and perhaps of greater interest, and partly, doubtless, because the lakes are more important for the production of fish. The greater credit, perhaps, ought to be given for the attempt to throw light on the problems of river plankton by long continued systematic observations.

The work centered at Havana on the Illinois River, and collections were made, not only in the river, but in neighboring waters, including Spoon River, Quiver Lake, Dogfish Lake, Flag Lake, Thompson's Lake, and Phelps Lake. The conditions in the Illinois River are unusual because of the large amount of sewage that comes from Chicago and the other cities in its course. Spoon River is a typical prairie river with no artificial conditions. The lakes examined are all connected with the river at the time of high water, and some of them have a permanent connection through the year. Thus the work of investigation included a study of the Illinois River, of a river uncontaminated with sewage, and of several shallow bodies of water which were filled by overflow from the river and were stagnant for a greater or less part of the year. Something over a hundred pages are devoted to a somewhat detailed discussion of the geological and hydrographical features of the basin of the Illinois.

The remainder of the work is a discussion of the quantitative investigation of the plankton. The methods of collection worked out by Dr. Kofoid are somewhat different from those employed at other stations, and the author naturally considers them superior. It may be questioned, however, whether the methods used in the shallow silt-laden waters of the river could be used with advantage in a study of limnoplankton. The centrifuge was used to get the plankton into compact form for measurement, and this method seems to be the most practical that has yet been devised.

The study of plankton production was carried out with the most painstaking care; and this involved an amount of pure drudgery which only one who has undertaken a similar piece of work can really appreciate. Yet one must confess to some surprise that after such an enormous amount of work in testing methods and in computing collections, the somewhat elaborate discussion of the transverse distribution of plankton should be based on only two sets of collections.

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[3] KOFOID, C. A., The plankton of the Illinois River, 1894–1899, with introductory notes upon the hydrography of the Illinois River and its basin. Part I. Quantitative investigations and general results. Bull. Ills. State Lab. Nat. Hist. vol. **6**. 8vo. pp. xviii + 629. *pls. 50.* 1903.

At the close of the work the general results are summarized under twenty-six heads. In a brief review it is impossible even to state these, but reference may be made to such as are of most general interest. The horizontal distribution of river plankton is practically uniform. The maximum period of production is from April to June, but with great irregularities. Generally speaking, high water reduces the amount of plankton by dilution, and low water increases it by giving time for development of the various forms. So the more or less stagnant waters of the shallow lakes have a greater plankton production.

"Other things being equal, bodies of fresh water free from vegetation (submerged macro-flora) produce more plankton than those rich in such vegetation." This statement, if proven—and the author makes out a strong case—is a very important one. If it were shown, as it probably can be, that the reduction in plankton in lakes with submerged vegetation is due to lack of plankton plants rather than to the small number of plankton animals, the generalization might go far toward explaining the greater fish production of shallow lakes. It has been shown by the reviewer that deep lakes produce more animal plankton per square meter than shallow lakes, and that the greater total plankton production of shallow lakes is due to the vegetable part of the plankton. It is the animal part of the plankton that furnishes most of the food for fish. The surplus of vegetable plankton is simply waste. Hence, so far as food production is concerned, the shallow lakes have no advantage over the deeper ones. But it is a matter of common observation that the shallow lakes, with submerged vegetation, are favorable to the production of fish. Is it not probable that the superiority of the shallow lake over the deeper one is not in the greater amount of plankton, but in that the submerged vegetation furnishes a favorable physical environment in which the fish may find hiding places? Probably the submerged vegetation does not remove from the water the part of the plankton that is important as food for fish.

In comparing the plankton of the river with that of lakes, the author considers the river among the more fertile bodies of water. This fertility appears greater, however, because of the author's preference for stating plankton amounts in terms of cubic meters. This, of course, is a matter of personal preference; the reviewer prefers to state it in terms of a surface unit, as did Hensen in his original plankton work. Especially, if one is to compare the fertility of a body of water with that of a piece of ground, the surface unit is the only practical one.

Two criticisms may be made upon the work as a whole. First, its bulk is rather unfortunate, for doubtless many who would be glad to get at the general results will hesitate to read so large a book. Second, it would have been a great convenience had it been indexed. These are minor criticisms, however, for the work is a most important and valuable one. It should perhaps be mentioned that, while this work on the Illinois River was planned and carried out by Dr. Kofoid, it may, after all, be considered as the direct outcome of work which has been carried on by the director of the laboratory, Dr. S. A. Forbes, for the past generation.—C. DWIGHT MARSH.

MINOR NOTICES.

THE FIRST VOLUME of the *Jahresbericht der Vereinigung der Vertreter der angewandten Botanik* contains several articles of interest from the standpoint of applied botany. ADERHOLD[4] reviews the present status of our knowledge of Bordeaux mixture, discussing critically the results of Clark, Sturgis, Bain, Rumm, and others who have investigated the action of this fungicide, both on parasites and host plants. SCHULZE[5] discusses the influence of sterilization of soil on plants grown therein. It is found that this influence differs both with the character of the soil and with the kinds of plants used. The author points out that these factors ought to be considered in experiments where plants are grown in sterilized soil. NESTLER[6] has investigated the occurrence of thein in the tea plant. The substance is found present in varying amounts in the leaves, bark, flowers, fruit, and seeds; in fact in all parts of the plant except the roots and wood. An article by WIELER[7] deals with some little-observed smoke injuries. The author calls special attention to poisoning of the soil under trees in the vicinity of smelters due to sulfurous acid and other substances dissolved in rain water. This poisoning of the soil produces premature autumnal coloration of the leaves, especially in the beech. Other articles deal with seed testing and with fermentation.—H. HASSELBRING.

THE SECOND PART of Grout's[8] *Mosses with a hand-lens and microscope* well sustains the promise of its predecessor, as we judge from advance sheets with which we have been favored. The issue completes the Dicranaceae, Grimmiaceae, and Ephemeraceae, and presents a good part of the Tortula-

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[4] ADERHOLD, R., Der heutige Stand unseres Kenntnisse über die Wirkung und Verwert und der Bordeauxbrühe als Pflanzenschutzmittel. Jahresb. Vereinig. Vert. angew. Bot. 1: 12–36. 1903.

[5] SCHULZE, C., Einige Beobachtungen über die Einwirkung der Boden-sterilization auf die Entwickelung der Pflanzen. *ibid.* 37–44.

[6] NESTLER, A., Untersuchungen über das Thein der Theepflanze. *ibid.* 54–61.

[7] WIELER, A., Wenig beachtete Rauchbeschädigungen. *ibid.* 62–78.

[8] GROUT, A. J., Mosses with a hand lens and microscope. Part II. Imp. 8vo. pp. 87–166. *figs. 36–76. pls. 11–35.* Brooklyn: The author. $1.00. 1904.